

JPRS 75649

7 May 1980

USSR Report

ELECTRONICS AND ELECTRICAL ENGINEERING

No. 64



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USSR REPORT
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ANTENNAS

UDC 621.391.828:621.396.67

SHIELDS FOR PROTECTING ANTENNAS OF RADIO RELAY SYSTEMS FROM NOISE

Moscow ELEKTROSVYAZ' in Russian No 2, 1980 pp 31-34 manuscript received 14 Mar 79

MEL'NIKOV, YU.M., PETROVA, V.G. and BORISOV, N.N.

[Abstract] Electromagnetic shields are employed for the purpose of improving the electromagnetic compatibility of radio relay systems and other communications systems which create mutual interference. Shields are described and discussed here which can be used for protecting from noise highly directional antennas with a gain of 40 to 43 dB. The angle between the direction of the noise's arrival and the direction of the main lobe of the directivity diagram must not be less than 1° . Shields of the double-ring and double-frame type are discussed. A diagram is shown of the installation of a shield of the double-ring type. The angle between the line to the noise source and the shield's installation plane equals $90 \pm 5^\circ$. The shield's center lies on a line conforming to the ray along which the noise is propagated, taking into account the mean value of refraction. Deviations in the points of the shield's position from the calculated along the line to the noise source are permissible over the range of r_0 , representing the distance between the protected antenna and the shield. Errors in installation of the shield along axes X and Y must not exceed ± 0.5 m. The masts on which this shield is suspended distort its electrical characteristics, resulting in a reduction in suppression of the noise field. The thicker the mast, the greater the increase in the level of the noise field at the antenna's aperture. The level of this noise field can be reduced by using lattice-type supports rather than solid ones, but the influence of the supports is nevertheless considerable. The double-frame type of shield was developed for the purpose of reducing the influence of the supports. In this type of shield the sections of the supports making the major contribution to the scattered field are shaded by the curtain of a shield made of a radio-paque material. They thus do not influence its suppression properties. It is demonstrated that a double-frame type of shield creates intense suppression of the field at the center of the suppression region; in real antennas the field diminishes toward the edges of the aperture and the maximum contribution to the field in the antenna's output is created by the central sections of the aperture. This demonstrates the advantages of a double frame over a double ring from the viewpoint of the influence of the supports. The frequency-response properties of this type of shield enable it to operate in radio relay bands of 4 GHz and higher. The shield's curtain is made of sheet metal and its surface can be of any form. Its contours, however, must be accurate within one percent. The results are given of an

experimental study of the suppression properties of a shield in the form of a double frame when working with an axisymmetric antenna. It is demonstrated that a double frame effectively suppresses the antenna's radiation both in the region of far-range lateral radiation, and is therefore a sufficiently universal means of protecting an antenna from noise. Figures 8; tables 1; references: 5 Russian.
[170-8831]

UDC 621.396.67

ZENITH RADIATION TURNSTILE ANTENNA

Moscow ELEKTROSVYAZ' in Russian No 2, 1980 pp 35-39 manuscript received
24 Jan 79

SHERED'KO, YE.YU.

[Abstract] A procedure is presented for calculating the directivity characteristics and gain of zenith radiation turnstile transmitting antennas, which will be widely used in the reconstruction and development of local shortwave radio broadcasting networks in Union republics, autonomous oblasts and national okrugs. A general discussions is presented of the requirements for the parameters of these antennas. They will be used for local shortwave radio broadcasting in the 60 to 68.20 and 73.84 to 75.95 m bands. A key requirement is the ability for the multiple simultaneous utilization of the same or close frequencies by several stations spaced apart, with minimum interference. The required "territorial" selectivity can be arrived at by employing radio waves for broadcasting which are refracted in layers of the ionosphere, and transmitting antennas with a directivity characteristic of a special form in the vertical plane. The transmitting antenna must be nondirectional in the horizontal plane. The polarization of the wave created by the antenna can be either linear or circular (or elliptical) with right or left rotation, depending on requirements, with the key parameters kept approximately constant in any operating mode. The considerable influence of the vertical components of the electric field strength vector can be eliminated if the transmitting antenna is made only of horizontally radiating elements. This component can be eliminated by placing below the radiating elements a counterpoise consisting of a network of horizontal wires parallel to the radiating elements and spaced at a different distance of not less than one tenth of the wavelength. The overall dimensions of this counterpoise must be greater than the horizontal dimensions of the radiating system by not less than one quarter of the wavelength in each direction. With reference to these and other considerations, the structural features of a zenith radiation turnstile antenna are discussed. The parameters are calculated, of an antenna for the 3.75 to 5 MHz (60 to 80 m) band

with a mid-band frequency of 4.375 MHz (68.6 m). The antenna consists of four linear symmetric horizontal dipoles with reduced wave impedance, four distributing feeders, and a phasing stub for matching the transformer with the main supplying feeder. The dipoles are so arranged that in the plane they form four groups of crosses whose centers lie at the corners of a square. There is no electrical contact between crossing dipoles in a single cross, since they are spaced apart vertically. The geometrical dimensions of the antenna's elements are determined by the operating wavelength for which the antenna is designed. For an operating wavelength of λ_0 , the arm of a dipole measures $l = 0.45\lambda_0$, the distance between parallel dipoles is $0.5\lambda_0$, the mean height of the counterpoise above the surface of the ground is $0.25\lambda_0$, the length of the distributing feeders is $l_r = 0.5\lambda_0$ and the length of the phasing stub is $0.25\lambda_0$. The wave impedance of the distributing feeders is 600Ω , of the phasing stub 300Ω and of the main supplying feeder 300Ω . With this geometry, the input impedance of each dipole at a wavelength of λ_0 equals approximately p^2/R_z , where p is the wave impedance of the dipole and $R_z = 285\Omega$ is its radiation resistance. Good matching with the secondary and main feeders and with the matching transformer and phasing stub is achieved by employing a dipole wave impedance of approximately 400Ω . Good matching is maintained in any operating mode of the antenna. The directional characteristics, polarization characteristics and band properties of this antenna are discussed in detail. The antenna's operating mode is switched through the low-impedance output terminals of a TF150/300 transformer. Good matching of all elements of the antenna-feeder channel with relatively not too high wave impedance of the dipoles makes it possible to use the antenna with power fed to it on the order of 100 kW and more. Figures 6; tables 1; references: 7 Russian. [170-8831]

CERTAIN ASPECTS OF COMPUTERS; CONTROL, AUTOMATION,
TELEMECHANICS, TELEMETERING, MACHINE DESIGNING AND PLANNING

UDC 621.317.799:519.241.6

APPLICATION OF THE METHOD OF SEQUENTIAL DIFFERENCES TO THE PROBLEM OF
STATISTICAL ESTIMATION OF SCATTERING CHARACTERISTICS

Leningrad IZV.VUZ: PRIBOROSTROYENIYE in Russian, Vol 22, No 12, Dec 79,
pp. 44-50, manuscript received 15 Mar 78

BARANOV, V. P., IOFFE, A. YA., PETROV, A. I., Red Banner Military Engineering
Institute imeni A. F. Mozhayskaya

[Abstract] A number of earlier works have suggested the method of sequential differences for estimation of the scattering characteristics of a statistical estimate. The essence of this method is that suitable statistics are formed as a certain function of the difference between the results of sequential observations. This article studies the properties of an estimate of mean-square deviation of an observed random quantity by the method of successive differences. A highly effective method of estimation within intervals is suggested. Figures 1; references: 6 Russian.
[164-6508]

UDC 621.374.32

A UNIVERSAL DECADE COUNTER BASED ON INTEGRATED MICROCIRCUITS

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 1, Jan-Feb 80 pp 138-141 manuscript received 14 Aug 78

KOTOV, V. S. and EGLITIS, L. YA.

[Abstract] A pulse counter circuit is described which can be used to construct either adding or subtracting stages for construction of a reversible counter if the stages are used in combination. Devices made from the described circuits can be used in various types of instruments. Figures 5; references: 3 Russian.
[180-6521]

CERTAIN ASPECTS OF PHOTOGRAPHY, MOTION
PICTURES AND TELEVISION

UDC: 621.316.5.002.4

USE OF HIGH SPEED RASTER CINEMATOGRAPHY TO STUDY SWITCHING PROCESSES IN
ELECTRIC APPARATUS

Minsk IZV.VUZ: ENERGETIKA in Russian, No 1, Jan 80, pp. 16-21, manuscript
received 14 Sep 79

TEREKHOV, A. A., candidate of technical sciences, Dotsent, All-Union
Institute of Electric Engineering imeni V. I. Lenin

[Abstract] Oscillographic studies, while providing important information on the behavior of switching apparatus and switching processes, frequently cannot answer the question of the reasons for failures and associated damage in high-current switching equipment. One effective means of this analysis is high speed cinematography which, however, is difficult to use inside sealed chambers such as those which contain switches. Raster high speed cinematography does not have this problem, and was used to study the switching processes in a type VEM-6 electromagnetic breaker. Diagrams of pictures produced by this process are presented. The process produced materials which clarify the physical picture of the switching process, and its analysis provided additional information to supplement that provided by analysis of oscillograms. The paper was submitted by a scientific seminar. Figures 4; references: 2 Russian.
[165-6508]

AN OPTO ELECTRONIC IMAGE DISCRIMINATION DEVICE BASED ON OPTICAL DENSITY LEVELS

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 1, Jan-Feb 80 pp 152-155 manuscript received 18 Aug 78

KURASHOV, E. M., Institute of Clinical and Experimental Medicine of the Siberian Branch of the USSR Academy of Medical Sciences, Novosibirsk

[Abstract] A video signal quantification device is described which utilizes the grids of reference levels formed directly by the television camera tube. The images of the investigated object and of a multigradation optical wedge are projected simultaneously on the edges of a photometric luenmer tube. The step-like signal from the optical wedge is used as a comparison reference. Discrete selection of the number of quantification levels with spacing of 8, 16, 32 and 64 is provided as a function of the contrast of the investigated image and the signal-noise ratio. The error of densimetry and photometry is no greater than five percent and the density gradations are 32 with a signal-noise ratio of 5. Figures 3; references: 5 Russian. [180-6521]

UDC 534.8.621.374

A RADIO PULSE DELAY TIME MEASURING CIRCUIT USED IN ACOUSTIC EXPERIMENTS

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 1, Jan-Feb 80 pp 168-170 manuscript received 3 Jul 78

VORONOV, V. P., MALYSHEV, V. M. and MERKULOV, V. M., All-Union Scientific Research Institute of Physicotechnical and Radio Engineering Measurements

[Abstract] A circuit for measuring signal delay time is described which was used to measure the speed of sound. A modulator shapes the pulses whose length and repetition rate are determined by the pulses of a driving oscillator and the space factor frequency determined by experimental conditions is shaped by a G4-102 generator. The random error of pulse delay time measurement was 1-2 nanoseconds at wave front steepness of 0.3 volts per microsecond, signal-noise ratio of 3 and averaging every 10^5 pulses. The circuit can be used in any measurements where the delay time between two repeated signals must be determined. Figures 2; references: 2 Russian. [180-6521]

COMMUNICATIONS; COMMUNICATION EQUIPMENT INCLUDING
RECEIVERS AND TRANSMITTERS; NETWORKS;
RADIO PHYSICS; DATA TRANSMISSION AND
PROCESSING; INFORMATION THEORY

UDC 621.315.2:535.317

CALCULATION OF CROSSTALK IN OPTICAL CABLES

Moscow ELEKTROSVYAZ' in Russian No 2, 1980 pp 44-48 manuscript received
26 Sep 79

GRODNEV, G.I.

[Abstract] For a correct estimate of the electrical characteristics of optical cables and for their optimal design it is necessary to know the magnitude of the crosstalk between fiber light pipes placed in a common cable and the immunity of these light pipes from this crosstalk. An investigation is made into crosstalk in optical cables by considering in succession the following questions: 1) The effect of the radiation of energy into the environment with different angles of incidence of the wave; 2) The transmission of crosstalk through the optical shell; and 3) Immunity from crosstalk in long optical lines. It is demonstrated that crosstalk in optical cables is caused by an external field leaking through the optical shell of a fiber light pipe, whereby the magnitude of this field is a function of the influencing field and the protective properties of the shell. The refracted field is determined by the angle of entry of the field into the light pipe, ϕ , i.e., the angle of the incident wave. The smaller angle ϕ as compared with the angle of total reflection, θ , the greater the energy which leaks into the external environment. Partial leakage of energy occurs even with $\phi \approx \theta$. When going from a medium with a higher optical density to one with a lower one, the wave, upon the condition that $\phi \geq \theta$, is totally reflected, i.e., in principle there is no refracted wave. Then the field is basically concentrated in the light pipe's core and is effectively transmitted along it. When $\phi < \theta$ a refracted wave appears and a considerable portion of its energy penetrates the shell and crosses over into neighboring light pipes in the form of noise. Crosstalk between light pipes depends substantially on the thickness of the optical shell; as the thickness becomes greater the external field diminishes exponentially. The longer the wave, the greater the external field, and therefore the greater the crosstalk with neighboring circuits. The greater the difference between the refractive index of the core and that of the shell, the stronger the effect of reflection of the field at the interface and the slighter the crosstalk. Crosstalk is increased as light pipes are placed closer together. Crosstalk increases as an optical cable becomes longer and its immunity is

diminished under these conditions. In practice optical fibers usually have a polymeric coating. The results of an investigation of the protective effect of the two-layer structure consisting of the shell and coating indicate that the use of an absorbing coating made of a polymeric material makes it possible to reduce crosstalk in optical fibers. A theoretical analysis and engineering calculations are presented, along with results represented graphically. Figures 7; references 8: 6 Russian; 2 Western.
[170-8831]

UDC: 621.371.332.12

ANGLES OF ARRIVAL OF A REFLECTED IONOSPHERIC SIGNAL WITH MULTIPLE PATHS OF PROPAGATION

Moscow RADIOTEKHNIKA in Russian, Vol 35, No 2, Feb 80, pp. 25-29, manuscript received 2 Jan 79

GUSEV, V. D., PRIKHOD'KO, L. I.

[Abstract] A study is made of the direction of arrival of an ionospheric signal and attempts are made to decrease the error of angular measurements caused by multiple-path propagation. The article studies the angles of arrival of a multimode signal for a resulting signal which is a superposition of plane waves. Under actual conditions, because of ionospheric scattering, the angles of arrival of each mode fluctuate about a mean value. Figures 2; references: 3 Russian.
[173-6508]

UDC 621.373.826:621.315.215

ANALYSIS OF CROSSTALK IN OPTICAL COMMUNICATIONS CABLES

Moscow ELEKTROSVYAZ' in Russian No 2, 1980 pp 40-44 manuscript received 27 Dec 78

KOROBKO, O.V.

[Abstract] An analysis is made of crosstalk between optical fibers, which leads to the general conclusion that the crosstalk phenomenon has been proved theoretically and experimentally, but has been insufficiently studied. No general theory exists for crosstalk between optical fibers in a cable core in which the fibers are bent and nonuniform. Noise immunity between optical fibers varies over a wide range. In developing designs for optical cables

for communications purposes, the necessity is stressed of taking into account the crosstalk between real and not ideal optical fibers making up the cable. An analysis of crosstalk can be made either on the basis of the wave theory or of the approximations of geometrical optics for multimode optical fibers. Optical fibers are placed under the heading of dielectric waveguides representing open guide systems. The most widespread type of optical fiber is a two-layer fiber with a circular cross section in the form of a core with radius a and a refractive index of n_1 , surrounded by a shell with radius b and a somewhat lower refractive index of n_2 , whereby $n_1 - n_2 = 10^{-2}$ to 10^{-3} . The attenuation of optical fibers used in cable communications is usually from 2 to 20 dB/km. Light is transmitted through these fibers on the basis of the phenomenon of total internal reflection from the interface of the core and shell of the fiber, whereby one or more types of waves can be propagated. A single-mode process is achieved if the diameter of the fiber's core is commensurate with the wavelength of the transmitted coherent radiation. Multi-mode fibers have a core diameter which is much greater than the wavelength of the transmitted radiation. If two optical fibers are placed in direct proximity, their electromagnetic fields overlap and part of the energy crosses from one fiber into the next, in which it is evidenced as noise. From the viewpoint of geometrical optics crosstalk between optical fibers is explained by the phenomenon of the disruption of total internal reflection at the interface of the core and shell of the fiber. The level of crosstalk between optical fibers depends on the construction both of the fibers themselves and of the cable core. Three core designs are discussed, in terms of the origin of crosstalk in them. These include a bunched conductor with the fibers arranged in a hexagonal pattern, an American cable employing a rectangular arrangement, a ribbon type of cable design, and a cable in which fibers are arranged around the circumference of the cable's cross section, whose center is unoccupied. It is stressed that the analysis of crosstalk between optical fibers in a cable core in generalized form is a very complex problem; therefore a few particular cases are considered here. Equations are derived for coupled waves in single-mode optical fibers. It is shown that only modes which have identical or close propagation constants are effectively coupled. Equations are derived for coupled modes and the coupling coefficient which are sufficiently general and can be made specific for a number of particular cases of practical interest. Multimode fibers are also discussed, which are the most promising from the viewpoint of the importance of light-emitting diodes as radiation sources for inexpensive optical communications lines. The method of geometrical optics is employed to estimate the noise resulting from crosstalk, starting with the quantity of noise immunity at the remote end of the fiber. A comparison is made between the respective advantages and disadvantages of the geometrical optics and wave optics methods of analyzing crosstalk in multimode fibers. The approaches thus far devised can be used only for particular cases. Figures 4; references 8: 3 Russian; 5 Western.

[170-8831]

FREQUENCY DETECTORS BASED ON DIGITAL PHASE AUTOMATIC FREQUENCY CONTROL SYSTEMS

Moscow RADIOTEKHNIKA in Russian, Vol 35, No 2, Feb 80, pp. 43-46, manuscript received 28 Jun 79

TYAZHEV, A. I.

[Abstract] A description is presented of frequency detectors based on digital systems of phase automatic frequency control with and without analog-digital and digital-analog converters. Calculation formulas are presented. The detectors have a number of advantages over analog detectors: circuit simplicity requiring no adjustment or tuning during manufacture or operation; possibility of rapid changing of the steepness of the characteristic and the width of its operating section over a broad range; linearity of the detector characteristic; insensitivity to instability in the frequency of the signal; high stability and accuracy of parameters; high reliability; and small size and weight. Figures 3; references 5: 4 Russian; 1 Western.
[173-6508]

LINEAR FREQUENCY MODULATION SIGNALS WITH PHASE KEYING WITHIN PULSES

Moscow RADIOTEKHNIKA in Russian, Vol 35, No 2, Feb 80, pp. 57-60, manuscript received 12 Aug 79

KOCHEMASOV, V. N., KRYAZHEV, V. P., OKONESHNIKOV, V. S.

[Abstract] The properties of LFM (linear frequency modulation) signals with phase keying within each pulse, a natural development of LFM signals with harmonic phase modulation, are analyzed. Coding of the phase of the LFM signal within a pulse allows the construction of large systems of moderately correlated signals, promising for use in communication systems. A study is made of the change in the spectrum of an LFM signal with a base of 225 when its internal phase is coded with a pseudorandom M sequence. LFM-PM signals can be used in interference-stable communication lines where it is necessary to have a large number of slightly correlated channels. Figures 2; references 2: 1 Russian; 1 Western.
[173-6508]

UDC: 621.391

ESTIMATION OF THE PARAMETERS OF TWO-DIMENSIONAL SPATIAL SIGNALS

Moscow RADIOTEKHNIKA in Russian, Vol 35, No 2, Feb 80, pp. 62-64, manuscript received 14 Jul 77

KHOMYAKOV, E. N., KARTASHOV, O. G.

[Abstract] A study is made of the measurement of the angle of relative rotation of a two-dimensional spatial signal, and the potential accuracy of the corresponding electronic device is analyzed. Analysis of the equations used shows that the maximum accuracy of measurement of phase can be achieved using signals whose spectra have the form of delta functions at the boundary frequencies of the spectrum. The minimum accuracy occurs for signals whose spectra are identical at the boundary frequencies and concentrated in the area of 0 frequencies. The entire set of real two-dimensional signals occupies an intermediate position between these types of signals. References: 4 Russian. [173-6508]

UDC: 621.391

EFFECTIVENESS OF TRANSMISSION OF INFORMATION WITH DISCRETE CONTROL OF SIGNAL LENGTH

Moscow RADIOTEKHNIKA in Russian, Vol 35, No 2, Feb 80, pp. 69-73, manuscript received 15 Jan 79

GUT, R. E.

[Abstract] Studies of the effectiveness of radio communication systems with adaptation to changing transmission conditions by control of the length of an elementary signal element usually analyze only two cases: binary control and continual control. This article studies the more general situation, in which the speed of transmission can take on any one of N possible values, but not an infinite number. The effectiveness of this system essentially depends on the preliminary selection of the proper values. An equation is derived to assist in the selection. The author thanks Ye. A. Vasil'ev for some calculations. Figures 2; references 9: 6 Russian; 3 Western. [173-6508]

UDC: 621.391.1

CORRELATION COEFFICIENT OF THE PHASE OF A SIGNAL WHEN CORRELATED GAUSSIAN NOISE WITH UNBALANCED SPECTRAL DENSITY IS PRESENT

Moscow **RADIOTEKHNIKA** in Russian, Vol 35, No 2, Feb 80, pp. 55-57, manuscript received 27 Feb 79

RYBAKOV, B. S.

[Abstract] The phase correlation coefficient of an additive mixture of a deterministic signal and normal narrow-band noise is analyzed for a signal which is modulated in amplitude and phase, for noise with an unbalanced energy spectrum. Figures 2; tables 1; references: 6 Russian.
[173-6508]

UDC: 621.391.019.4

RECOGNITION OF OBJECTS WITH GENERAL IMITATION AND NOISE IN THE CHANNEL BY MEANS OF THE THEORY OF GAMES

Moscow **RADIOTEKHNIKA** in Russian, Vol 35, No 2, Feb 80, pp. 64-67, manuscript received 24 Apr 79

NESTERUK, V. F.

[Abstract] An earlier work stated and solved the problem of recognition with general imitation, i. e., when imitation can be performed not only by groups of signals, but also by "silence" in the observation zone. This problem is analyzed here for a homogeneous symmetrical channel with noise, i.e., for the most unfavorable case. This is a continuation of the earlier article, which contains the statement of the problem and all symbols. The optimal strategies of the players are defined and decision areas are diagrammed. It is found that the strategy of silence is used by the imitator in all cases without exception. It is either the only section or one component of a mixed strategy used with a definite probability. Figures 2; references: 3 Russian.
[173-6508]

ESTIMATE OF NOISE REJECTION OF EQUIPMENT FOR COMBINING SPACED SIGNALS

Moscow ELEKTROSVYAZ' in Russian No 2, 1980 pp 7-10 manuscript received 14 Mar 79

POLUSHIN, P. A., SAMOYLOV, A.G. and TARAKANKOV, S.P.

[Abstract] The spaced reception of radio signals is one method used to improve the noise rejection of tropospheric communications and the gain from spacing is realized by means of equipment for combining spaced signals. A comparative evaluation is made here of certain combining equipment in light of a refined model of processes of the distortion of signals in the troposphere. This model of fading of the signal's peak value in tropospheric communications is based on a four-parameter distribution of the signal's peak value. Previous studies have been devoted to a comparative analysis of different combining equipment for a Rayleigh model of rapid fading of the signal's peak value. An estimate is made of the noise rejection of the basic methods of combining on the basis of an approximation equation for determining the probability of a disruption of communications with a four-parameter distribution of the signal's peak value. Combination methods discussed are automatic selection, both in terms of the maximum amplitude of the signal and the maximum signal-to-noise ratio, linear combination and optimal combination. It is demonstrated that with unequal power of the additive noise in spacing branches, for a four-parameter distribution of the signal's peak value, automatic selection in terms of the maximum of the signal-to-noise ratio has greater noise rejection than automatic selection in terms of the maximum amplitude of the signal, and this difference increases with an increase in the spacing factor. Approximation equations are derived which are convenient for practical utilization in determining the probability of an interruption in communications when employing automatic selection and linear and optimal combination for an arbitrary spacing factor within the framework of the four-parameter model of signal peak value fading considered. The methods of combining are compared for identical values of the mean power of the additive noise of the i -th branch, and it is concluded that with an increase in the spacing factor the gain from using optimal combination increases as compared with linear combination and reaches approximately 1.2 dB. This gain is infinite as compared with automatic selection. The conclusions regarding the comparative noise rejection of combining equipment arrived at earlier for the Rayleigh model of signal peak value fading are valid for this more general four-parameter model of rapid fading. Figures 2; tables 2; references: 8 Russian.
[170-8831]

UDC: 621.391.828

CALCULATION OF RADIO INTERFERENCE IN A MULTICHANNEL COMMUNICATIONS SYSTEM WITH FREQUENCY MODULATION CAUSED BY AN INTERFERING SIGNAL TRANSMITTING DIGITAL INFORMATION

Moscow RADIOTEKHNIKA in Russian, Vol 35, No 2, Feb 80, pp. 21-24, manuscript received after completion 25 Jul 79

IVANOV, D. I.

[Abstract] The level is calculated of interference which arises in a telephone channel of a multichannel FM communication system because of an interfering digital signal with multilevel phase keying. The calculations show that an increase in the frequency shift used in keying causes some increase in the noise power in the analog channel. Figures 5; references 4: 2 Russian; 2 Western.
[173-6508]

UDC 621.396.67

EMPLOYMENT OF PASSIVE REFLECTOR RADIO RELAYS IN RADIO RELAY SYSTEMS

Moscow ELEKTROSVYAZ' in Russian No 2, 1980 pp 1-6 manuscript received 4 Jul 79

KUZ'MIN, I.V., LOKSHIN, V. L., NAFIKOV, YU.I. and YAMPOL'SKIY, V. G.

[Abstract] A general discussion is presented of the application of passive reflector radio relays (PRZ's) and double-antenna passive radio relays (DAPR's), which make it possible to realize practically any relay angle in both the vertical and horizontal planes. The reflecting surface of a PRZ is in the form of a flat metal screen which must be accurately designed for the radio band employed and must be rigidly fixed in space. The screen usually measures a few dozen or hundred wavelengths. These radio relays are usually placed on dominating heights, while the transmitter, repeater and receiving equipment are located at the foot of hills, in valleys and near communication lines and population centers. The choice of PRZ design depends chiefly on the relay angle, and the effectiveness of a PRZ's operation in an interval in a radio relay system is determined by the amount of the primary source's energy covered by the radio relay's aperture and by the directional properties of the repeater which concentrates the energy in a narrow beam in the direction of the next station. The greater the size of the aperture, the greater the percentage of energy covered and the narrower the beam in which the re-emitted energy is concentrated. The effectiveness

of a PRZ increases the closer it is to one of the ends of an interval. PRZ's are widely used in radio relay systems located in mountainous and very rugged terrain. Their employment makes it possible to reduce substantially the number of active stations and reduce the height of antenna supports, thus resulting in a savings. Equations are presented for calculating attenuation in an interval, based on utilizing the concept of the equivalent aperture of a radio relay. Discussed in detail are PRZ arrangements employing a single reflector, two reflectors, a delta configuration and a Z-configuration. The conditions under which these types are used are discussed in terms of minimizing attenuation. DAPR's can be used in almost any situation and are simpler to tune than PRZ's. The procedure for calculation of attenuation of a signal in an interval differs for the cases when the PRZ is located in the far-range and close-range zones of the antennas of active stations. Taken into account is the utilization factor for the reflector's surface, which is in part a function of the precision of the surface's fabrication and of the influence of the ground. For the purpose of reducing the influence of the ground, it is recommended that PRZ's be placed on prominences so that the distance from the lower edge of the reflector to the surface of the ground is not less than 3 to 5 m. Equations are presented for determining the position of the radio relay's reflectors in space when designing and constructing PRZ's. The problem is discussed of the difference in the angle of the signal polarization plane in the apertures of a transmitting and receiving antenna in intervals in which PRZ's are employed. The greatest difference, a maximum of 90° , is reached on routes with an odd number of reflectors when the polarization in the aperture of the transmitting antenna differs substantially from the horizontal or vertical. This makes it necessary to outfit with polarization rotators the antenna-waveguide channels of active stations of a radio relay system. The question is discussed of the employment of antennas with an aperture of large area. When antennas with a gain of 40 to 45 dB are employed together with PRZ's the area of whose working surface equals 10 to 30 m^2 , the length of intervals usually is not greater than 30 to 45 km. A further increase in this length results in a drastic increase in cost, resulting from the increase in the area of the radio relay. When the area of a PRZ's aperture is increased, its directivity diagram is narrowed. Too narrow directivity diagrams cause difficulty in providing the required stability of communications in the interval, and this difficulty increases as the length of semi-intervals increases. To ensure the required communications stability, antennas with an aperture of large area must be installed at short semi-intervals, and to increase the width of the directivity diagram in the vertical plane, the vertical dimension of these antennas must be smaller than the horizontal. The employment of antennas with an aperture of large area is discussed in terms of the ability to construct passive radio relay junction stations (UPPR's) making it possible to relay a signal over several directions. It is demonstrated that it is feasible to construct a UPPR on dominating heights near communications centers and sources of television programs when it is difficult to set up radio relay communications directly from these points over several

directions because of an unfavorable terrain. The use of UPPR's can make it possible in individual instances to reduce the cost of constructing and running a radio relay system in mountainous and almost inaccessible areas. Figures 11; references 5: 4 Russian; 1 Western.
[170-8831]

UDC 621.396.96'03:621.391.26

AN ANALOG CORRELATOR FOR WIDEBAND NOISE SIGNALS

Moscow RADIOTEKHNIKA in Russian, Vol 35, No 2, Feb 80, pp. 39-41, manuscript received 27 Mar 78

SHELUKHIN, V. I.

[Abstract] A study is made of the characteristics of analog correlation analyzers for operation in the continuous radiation mode using wideband noise signals with predetermined self-correlation function and dispersion as modulating signals. These devices are somewhat hard to produce, because they must process signals with spectral widths of up to 20 MHz. A schematic diagram and characteristic curve are presented for such a device, and equations are presented for the amplitude characteristic of the DC amplifier used and the correlation function of the signal at the output. Figures 3; references: 4 Russian.
[173-6508]

UDC 621.396.97

INFLUENCE ON BROADCASTING QUALITY OF INSTABILITY OF A CHANNEL'S TRANSMISSION COEFFICIENT

Moscow ELEKTROSVYAZ' in Russian No 2, 1980 pp 29-30 manuscript received 7 Jan 77

GRISHIN, A. M.

[Abstract] Permissible variations (ΔK_p) in the transmission coefficient (K_p) of intercity sound broadcasting channels have been set at ± 2 dB per hour. Hitherto nothing has been said about the nature of these variations. Studies have shown that the stability of K_p for these channels lies 96 to 97 percent of the time within the range of the current norms, but approximately 35 percent of the time systematic variations in K_p occur which can exert an influence on broadcasting quality. These variations are of several types: abrupt changes; slow monotonic; and oscillating, i.e., both rapid and slow at a steady and periodically varying rate, with the frequency of

oscillations lying in the range of a few fractions of hertz. A subjective study was conducted at the radio broadcasting laboratory of MEIS [Moscow Electrical Engineering Institute of Communications] for the purpose of studying the perception by listeners of the most typical manifestations of instability of K_p . For this purpose a model was constructed of a communications channel of the highest class, which made it possible to introduce measured changes in K_p . Fifty persons took part in the study and consisted of broadcasting and sound recording audio engineers, members of the arts council of the USSR State Committee on Television and Radio Broadcasting, and well-known composers and vocalists. The listeners were presented individually with symphonic, piano and stage music and solo and choral singing. The volume was set at the arts-council-approved level of 90 dB·A. Each expert was given the problem of determining the threshold of the noticeability of ΔK_p in a channel with regard to the following types of instability of K_p : a single abrupt change with a maximum differential of 5 dB; abrupt periodic changes with a 2 s period; and oscillating changes with a period of 2, 10, 20 and 40 s with a maximum differential of 5 dB. Each expert was allowed to select the magnitude of the various kinds of instability in K_p and then by multiple trials to establish the value of ΔK_p at which a change in sound quality was noticed. The results show that the noticeability of ΔK_p depends both on the nature and the rate of its change. Results of the experiment demonstrate that the present standards for the variation in K_p of ± 2 dB are permissible only for slow changes in the transmission coefficient, when the time for K_p to change from its maximum to minimum value is greater than 10 s; with rapid changes in K_p their noticeability increases substantially. In the limiting case of a single abrupt change the permissible values of ΔK_p equal 1.2 and 1.3 dB for top-class and first-class channels, respectively. A top-class channel is one in which 30 percent of the experts noticed a change, and a first-class, in which 50 percent noticed one. Figures 2; references: 2 Russian.

[170-8831]

COMPONENTS AND CIRCUIT ELEMENTS, INCLUDING
WAVEGUIDES, CAVITY RESONATORS AND FILTERS

UDC: 621.372.852.2:621.382

A REFLECTIVE-TYPE PHASE KEYING DEVICE MADE OF A WAVEGUIDE FILLED WITH A
DIELECTRIC

Moscow RADIOTEKHNIKA in Russian, Vol 35, No 2, Feb 80, pp. 75-77, manuscript
received 13 Apr 79

DANYUSHEVSKIY, YU. Z., SHKALIKOV, V. N.

[Abstract] A reflective type phase keying device consisting of a section of waveguide containing a diode with a nonlinear capacitance was studied. To change the phase of the oscillation by 180° , the reflecting section must be switched from a series resonance to a parallel resonance and then back. Equivalent circuits are presented for the device, as well as conditions which must be met if no parasitic amplitude modulation is to occur. Analysis of the simplified equivalent circuit of the reflector section allows not only determination of the basic relationship between the PM parameters, but also determination of the optimal placement of the filled and emptied sections of the waveguides for minimum dependence of phase shift on frequency. Figures 2; references: 5 Russian.
[173-6508]

UDC 621.372.542.2

A SPLINE INTERPOLATING FILTER

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 1, Jan-Feb 80 pp 147-148 manuscript received 12 Aug 78

CHUBYKIN, B. V., Penza Polytechnical Institute

[Abstract] An interpolating filter is described which restores the continuous time function by discrete readouts using a second-order polynomial spline. Using polynomial splines for interpolation makes it possible to minimize the mean square error of restoration and at the same time simplifies the filter circuit. The filter contains two series-connected integrators, an added amplifier and analog storage device connected to a common

feedback circuit. Voltage is recorded in the analog storage device at the end of each quantification period. The key control pulses have amplitude of ± 12 volts and on-off time ratio of 90-100. Figures 2; references 3: 2 Russian; 1 Western.
[180-6521]

UDC: 621.391.8

STABILIZATION OF THE SIGNAL AT THE OUTPUT OF AN UNSTEADY FILTER FOLLOWING VARIOUS JUMPS IN THE PHASE OF THE INPUT SIGNAL

Leningrad IZV.VUZ: PRIBOROSTROYENIYE in Russian, Vol 22, No 12, Dec 79, pp. 36-40, manuscript received 10 Apr 77

BUKHARIN, S. V., YUROV, V. T., Voronezh State University imeni Lenin Komsomol

[Abstract] Because of the development of systems with phase keying, the practical necessity has arisen of studying the processes of the establishment and stabilization not only of the amplitude, but also of the phase of the signal at the output of a filter following a change in phase, as well as to estimate the degree of reduction in distortion following various phase jumps. The transient process at the output of such a filter is studied in this article as a function of the magnitude of the phase jump of the input signal. Diagrams of the transient process of both phase and amplitude at the filter output are presented, as well as a diagram of the variation of standardized duration of the transient process as a function of signal parameters. The unsteady filter is found to have a shorter transient process than a steady filter. Slight variations in the parameters of the selective quadrupole may not change this. The paper was recommended by the Department (Kafedr) of Electronics. Figures 3; references: 7 Russian.
[164-6508]

UDC: 621.317.08

HIGH SPEED MEASURING TRANSDUCERS WITH DOUBLE CORRECTION BASED ON THE INSTANTANEOUS VALUE OF THE INPUT SIGNAL

Leningrad IZV.VUZ: PRIBOROSTROYENIYE in Russian, Vol 22, No 12, Dec 79, pp. 3-7, manuscript received 29 Mar 79

KOVALEV, A. M., PUCHKOV, YU. I., Smolensk Branch, Moscow Institute of Power Engineering

[Abstract] This article describes a generalized structure for measuring transducers with double error correction based on the instantaneous value of the input signal. Previous devices of this type have operated in three sequential cycles, two used to correct additive and multiplicative error components, the third for the actual measurement conversion of the input signal. These devices are therefore slow and cannot be used for continuous real-time measurements. The present device does not have this shortcoming, because it works by sending the input signal to a special device which splits it, producing two values functionally related to the input. These two values are then transformed by a high speed measuring transducer while simultaneously the characteristic of the compensation portion is adjusted. The two transformed values of the input signal produced at the output of the measuring transducer are combined to produce the desired output signal. A block diagram of the device and equations describing its operation are presented. The paper was recommended by the Department (Kafedra) of Automatics and Telemechanics. Figures 1; references: 3 Russian.
[164-6508]

UDC: 621.374(088.8)

AN ELECTRONIC DEVICE FOR TRANSFORMATION OF PULSE LENGTH CHANGE INTO VOLTAGE

Leningrad IZV.VUZ; PRIBOROSTROYENIYE in Russian, Vol 22, No 12, Dec 79, pp. 12-13, manuscript received 1 Oct 78

VASILEVSKIY, S. F., MIKHAYLOVSKIY, G. I., Lipetsk Polytechnical Institute

[Abstract] It is often necessary to measure not the length of pulses but rather changes in the length of the pulses. Because the changes are usually much less than the length, the output signal resulting from changes in pulse length is very small and difficult to measure. This article suggests a device to perform this task which contains a pulse shaper with two outputs, each of which is connected to one of the inputs of an energy storage device. The storage device is connected through a comparison circuit and a second pulse shaper to the input of a flipflop. The output of the flipflop is connected to an integrator, and voltage from the output of the integrator is sent to one of the inputs of a differential amplifier. The other input receives a voltage which compensates the constant component of the output voltage of the integrator from the output of a device which separates the constant component. The first output of the first shaper is also connected to the input of the flipflop. The energy storage device may be a capacitive RC circuit, for example. The energy storage device may be a capacitive RC circuit, for example. The operation of the device is explained and a block diagram and time diagram are presented. The paper was recommended by the Department (Kafedra) of Computing Techniques. Figures 2; references: 2 Russian.

[164-6308]

UDC: 621.396.622:621.391.883.22.001.24

ENGINEERING METHOD OF CALCULATION OF THE NOISE FACTOR OF A FREQUENCY CONVERTER BASED ON MDS TRANSISTORS

Moscow RADIOTEKHNIKA in Russian, Vol 35, No 2, Feb 80, pp. 82-84, manuscript received 23 Apr 79

POLIKARPOV, E. D., KHENKIN, E. A., UNDEVICH, A. YA., GLUZBERG, D. KH.

[Abstract] In developing MDS-transistor based frequency converters, it is important to be able to calculate the noise factor rapidly and accurately, selecting the optimal operating mode from the standpoint of assuring the minimum noise factor, to determine the permissible spread of parameters of

the converter for assigned values of noise factor. One means of solving this problem is to use a nomographic method. Equations are presented for construction of such a nomogram, and the nomogram is illustrated. This nomogram allows rapid determination of the noise factor and determination of a number of interesting factors which are not obvious from analysis of the mathematical expressions. Figures 1; tables 3; references: 4 Russian.
[173-6508]

UDC 681.142:621.314.214.2.001.3

SINE-COSINE ROTATING TRANSFORMERS IN ANGEL-CODE CONVERTERS

Moscow ELEKTRICHESTVO in Russian No 9, Sep 79 pp 52-54 manuscript received 2 Feb 79

PRESNUKHIN, L.N., doctor of technical sciences, BARKHOTKIN, V.A., candidate of technical sciences, NEDOPEKIN, K.K., candidate of technical sciences, BOGOSLOVSKIY, A.P. and KOZLOV, G.A., engineers, Moscow

[Abstract] Sine-cosine rotating transformers (SKVT's) are discussed, which are inductive angle-data transmitters employed in angle-code converters for computer applications. Special emphasis is placed on the precision of these devices; two-pole SKVT's have an accuracy within the range of ± 1.5 to 5 minutes of angle. Improved precision can be achieved by using multipole SKVT's with electric reduction, so that when the SKVT's rotor turns one complete turn the output voltage of the SKVT is altered by a factor equal to the electric reduction factor. The design features of multi-pole SKVT's make it possible to reduce considerably the influence of technological factors on the error and make possible a measurement precision within the range of 0.15 to 0.5 minutes of angle. A table is given of the technical characteristics of a number of double-pole and multi-pole SKVT's operating with a supply voltage of 36 V and a frequency of 400 Hz produced in the USSR and most preferred for the design of angle-code converters. Examples are given on how to use and combine these SKVT's for designing a number of angle-code converters which provide different levels of conversion precision. Mentioned in particular are two-channel SKVT's such as the SKTD-6465 in which the precise and rough readings are combined designwise, i.e., the coils for the rough and precise channels are placed in the same gaps in a single stator and rotor package. The use of this angle-data transmitter in a double-reading angle-code converter makes it possible to reduce the dimensions of the measuring element, to simplify its design and provide a conversion accuracy on the level of one minute of angle. SKVT's in angle-code converters can operate in two modes, the amplitude or phase mode, i.e., the phase inverter mode. The second of these is preferable from the viewpoint of simplicity. Aspects are discussed of the structure of angle-code converters based on SKVT's. Angle-code phase converters can be designed to operate on different principles, the chief of which are the angle - phase - time interval - code mode; the cyclic mode with a strobing traveling marker; and the slave mode. Of

these the last two are the most precise. A description is given of some new structures for angle-code converters based on SKVT's developed by the Moscow Institute of Electronic Equipment for the purpose of achieving greater conversion accuracy. A structural diagram is shown of a slave angle-code converter and its operating principle is discussed. This converter is capable of providing a conversion accuracy of $\pm 0.5'$ depending on the class of SKVT used. It makes it possible to convert the angular positions of an SKVT shaft rotating at a rate of up to 100 r.p.m. A structural diagram is shown of a functional angle-code converter which makes it possible to avoid additional expenditures of machine time for conversion of the angle into its sine and cosine. This converter represents an expansion of functional capabilities in that it not only converts the angle of turn of the shaft into a code, but also converts the angle of turn into digital codes for the angle's sine and cosine. Discussed in addition is an angle-code converter based on the SKTD-6465 SKVT. The SKDT-6465 is made without a case and is designed for installing directly on shafts. A structural diagram is shown of this converter. This converter's electronics consist of a section which operates with digital discrete signals and a section which operates with analog signals. This converter has a bit configuration of 15 bits, gives rough and precise readings, measures 70 x 56 mm, and operates over a temperature range of $\pm 60^\circ\text{C}$. The digital section consists of a pulse generator, a divider, a counter, gates, rough and precise reading registers and delay lines. Reliable operation is made possible by the use of integrated microcircuits. Figures 3; references: 3 Russian.

[-8431]

UDC 681.355.8

SYNTHESIS OF COMPLEX INFRALOW-FREQUENCY VOLTAGES BY USING AN ANALOG SIGNAL CONVERTER

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 1, Jan-Feb 80 pp 114-116 manuscript received 27 Jun 78

VORONIN, V. I., Institute of Physical Problems of the USSR Academy of Sciences, Moscow

[Abstract] A universal synthesizer of infralow-frequency voltages which utilizes the principle of analog signal conversion is described. The analog signal converter consists of a peak detector with time gates, a control circuit and low-frequency filter. The control circuit generates a time gate and dump pulses upon external instructions. A periodic voltage is fed to the detector input and pulses synchronized with this voltage are fed to the starter input to synthesize the infralow-frequency voltage. The author thanks G.D. Bogomolov for formulation of the problem and helpful discussion. Figures 3; references: 2 Russian.

[180-6521]

ELECTRICAL ENGINEERING EQUIPMENT AND MACHINERY
APPLICATIONS AND THEORY

UDC 621.314

SELECTION OF THE DOMINANT FACTORS IN OPTIMIZATION OF ELECTRICAL EQUIPMENT

Novocherkassk IZV.VUZ: ELEKTROMEKHANIKA in Russian, No 1, Jan 80 pp 106-108 manuscript received 14 Apr 78

YEROSHENKO, GENNADIY PETROVICH, candidate of technical sciences, Dotsent, Saratov Institute of Agriculture Mechanization.

[Abstract] Optimization of design or performance parameters of electrical equipment is generally based on the minimum total theoretical costs, and the target function including installation costs as well as operating costs of energy or fuel and repair. Each cost category covers many factors so that the optimization problem becomes an unwieldy nonlinear one. It thus becomes necessary to select the dominant factors only without affecting the accuracy of the optimum solution. A method is shown here, simpler than a planned experiment, of selecting the dominant factors on the basis of the magnitudes of their derivatives at the limits of variation of an optimized parameter. All factors are classified into increasing functions of a parameter, decreasing functions of a parameter, and constant ones which do not affect the optimization process. The gist of the method is based on the fact that the target functional reaches its extremum when the value of the optimized parameter corresponds to the sum of the derivatives of increasing-function factors being equal to the sum of the derivatives of decreasing-function factors. Accordingly, the algorithm of selecting the dominant factors involves representing the target functional as a polynomial in terms of factors in both relevant classes, stipulating the limits for the optimized parameter, calculating the first derivatives of all factors at these limits, and selecting the factors, one of each class, whose first derivatives have the highest values. Should all first derivatives be equal, then the selection is made on the basis of the second derivatives. For illustration, this method is applied to a transformer and found to be accurate within 7 percent. Figures 1; references: 2 Russian.
[166-2413]

CALCULATION OF THE ELECTRIC PROTECTION OF UNDERGROUND PIPELINES

Moscow ELEKTRICHESTVO in Russian No 9, Sep 79 pp 71-74 manuscript received 19 Jul 78

TOZONI, O.V. and NEZHINSKAYA, M.M., Kiev

[Abstract] Cathode and drainage protection are used for the purpose of protecting metal underground structures from corrosion and dissolution promoted by stray currents. Up to this time there has been no established procedure for the calculation of protective devices by means of which it is possible to determine their number and type and the place to put them in a pipeline. To protect a pipeline from corrosion, the voltage in the insulating coating of the pipe must lie within a certain range. The problem thus consists in finding the distribution of protective devices whereby the voltage in the pipe's insulation will lie within this range. There must be as few protective devices as possible. The electrodynamic theory of circuits is employed to solve this problem. An insulated underground pipeline is represented as a communicator of direct current with a tubular layer of insulation with specific linear conductivity. Sources of potential are current leaking from railroad rails and electrical equipment grounding lines, as well as current leaking through the insulation of pipelines. The position of all ground is assumed to be known. Current leaking from rails is considerably greater than that leaking from the pipeline, and therefore it is assumed to be independent of the current of the pipeline and its protective devices. The problem is divided into two steps: First the distribution is found of current leaking from rails, on the assumption that the rails are communicators of direct current; and then a determination is made of current in the pipeline. A system of equations is derived with boundary conditions at the ends of the pipeline which is sufficient for a correct formulation of any specific problem. These equations are transformed into integral equations for the purpose of a numerical solution to the problem, and how this is done is demonstrated with a specific example. A ramified pipeline protected by cathode stations is located in the field of stray currents from a homogeneous d.c. power line grounded at its ends. The conductivity of the insulation and the resistance of the pipes are constant in each branch. The problem is solved of finding the distribution of the voltage in the insulation. The approach used makes it possible to solve a problem in the case when the conductivity of the pipe's insulation varies with the distance along the axis of the pipeline in keeping with a specific law, for example, when there is no insulation in certain sections of the pipeline and the pipeline makes contact with the ground. The results are given of a calculation and field measurements of voltages in the insulation of pipes for the example of cathode protection of a ramified gas line consisting of four sections of steel pipe. Good agreement is shown. Figures 4; references: 4 Russian.

[-AA31]

STUDY OF THE TEMPERATURE FIELD OF RACK-MOUNTED ELECTRONIC DEVICES

Leningrad IZV.VUZ: PRIBOROSTROYENIYE in Russian, Vol 22, No 12, Dec 79, pp. 65-70, manuscript received 5 Oct 78

DUL'NEV, G. N., POL'SHCHIKOV, B. P., POTYAGAYLO, A. YU., GASANOVA, V. V., Leningrad Institute of Precision Mechanics and Optics

[Abstract] A study is made of the temperature field around rack-mounted equipment, specifically electronic components such as a power supply in a common chassis with radiating fins on the outside, cards of discrete electronic components and integrated circuits mounted in the rack above the power supply and liberating heat by both radiation and convection. A mathematical description is presented of the processes of heat transfer in the apparatus studied. An experimental study is undertaken to verify the results of the mathematical model, and graphs are presented comparing the calculated and experimental data. The use of a hierarchical principal of calculation of the temperature field is found to yield satisfactory results for solution of the problem of automation of thermal planning of electronic devices. The paper was recommended by the Department (Kafedra) of Thermal Physics. Figures 4; references: 4 Russian.
[164-6508]

INSTRUMENTS, MEASURING DEVICES AND TESTERS;
METHODS OF MEASURING; GENERAL EXPERIMENTAL TECHNIQUES

UDC 533.9.03

USING SCANISTORS TO DIAGNOSE A MOVING PLASMA

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 1, Jan-Feb 80 pp 155-158 manuscript received 27 Jun 78

ZHDANOV, K. A., ZATSEPIN, V. G., LAZAREV, V. B. and TISHCHENKO, E. A.,
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[Abstract] An opto-electric system based on two scanistors with reference frequency of 5 kHz for rapid measurement of the aiming parameter of a moving plasma column and for measured voltage signal conversion is described. The scanistor is a single-line semiconducting component and is used to convert the optical image of the discharge into an electric signal. The scanistor has a disector that is unaffected by the magnetic field and it uses a low voltage. Figures 5; references: 6 Russian.
[180-6521]

UDC 538.69/539

SINGLE-AXIAL CRYSTAL COMPRESSION IN A MILLIMETER BAND LOW-TEMPERATURE ELECTRON PARAMAGNETIC RESONANCE SPECTROMETER

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 1, Jan-Feb 80 pp 166-167 manuscript received 17 Jul 78

LUKIN, S. N. and TSINTSADZE, G. A., Donetsk Physicotechnical Institute of the Ukrainian SSR Academy of Sciences

[Abstract] A device in which a specimen investigated in a millimeter electron paramagnetic resonance spectrometer is subjected to single-axial compression at low temperatures is described. A bellows press to create force and a superlong microwave resonator are used. A increase of pressure leads to compression of a zinc fluorosilicate crystal and the value of this compression is equal to approximately 10 microns according to the known elastic properties of the crystal. The device also has the capability of operating over a wide frequency range. Figures 2; references 8: 4 Russian; 4 Western.
[180-6521]

A SYSTEM FOR MOVING A MOSSBAUER SOURCE BASED ON INTEGRATED CIRCUITS

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 1, Jan-Feb 80 pp 163-165 manuscript received 29 Jun 78

BABIKOVA, YU. F., KOLPAKOV, N. S., NILOV, K. YE. and USPENSKIY, M. H.,
Moscow Engineering-Physics Institute

[Abstract] A system for moving a Mossbauer source, based on highly stable operational amplifiers and integrated logic components, is described. The system is designed to measure the velocity spectra of nuclear gamma-resonance. A sawtooth voltage signal to which is compared the output voltage of the velocity sensor is shaped by parabolic law and the error signal is then used to control the motion of the electrodynamic vibrating rod of a spectrometer. A quartz pulse oscillator with stable frequency triggers square-wave negative polarity pulses with repetition rate of 10 kHz. The single vibrator and start shaper perform the function of commutation and provide clear operation of all the system assemblies. Figures 2; references 4: 3 Russian; 1 Western.
[180-6521]

DETERMINATION OF PARAMETERS OF AN OBJECT BASED ON ITS REAL AND IMAGINARY FREQUENCY CHARACTERISTICS

Leningrad IZV.VUZ: PRIBOROSTROYENIYE in Russian, Vol 22, No 12, Dec 79, pp. 16-21, manuscript received 4 Jan 79

KATKOV, M. S., Leningrad Institute of Aviation Instrument Building

[Abstract] The possibility is demonstrated of simultaneously producing the required number of points on the frequency characteristic of an object of predetermined structure, while determining its parameters by means of a measurement system which continuously compensates for deviations in the real and imaginary parts of its frequency characteristic. A structural diagram of the measurement system is presented. The circuit for formation of control coordinates is based on the correlation method, which yields stable, high-quality filtering properties. Modeling was used to test the efficiency of the measurement system suggested as it responds to sudden changes in parameters and to analyze the accuracy of calculation of the increments of the parameters using the equations presented in the article for a specific example of an object with known transfer function. It is found that with sudden changes in a parameter of up to 25 percent, the error in calculation

using the approximate equations presented is not over 2 percent. Time diagrams of transient processes involved in measurement of the object are presented. The paper was recommended by the Department (Kafedra) of Automatics. Figures 2; references: 7 Russian. [164-6508]

UDC 621.316.722.4

A DIVIDER FOR MEASURING HIGH-VOLTAGE NANOSECOND PULSES

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 1, Jan-Feb 80 pp 125-126 manuscript received 18 Jul 78

ARKATOV, YU. M., VATSET, P. I., VOLOSHCHUK, V. I., GAVRILICHEV, YE. A., ZOLENKO, V. A. and PROKHORETS, I. M.

[Abstract] A voltage divider for measuring short high-voltage pulses on an installation with a streamer chamber in the electron beam of a linear accelerator is described. A flat capacitor and additional divider based on MLT resistors is used instead of a transfer capacitor. The total attenuation coefficient is determined by the geometric dimensions of the structural elements of the divider and the nominals of the resistors. Figures 2; references 4: 2 Russian; 2 Western. [180-6521]

UDC 621.317.74(088.8)

AN ATTACHMENT TO AUTOMATIC PANORAMIC METERS OF STANDING WAVE AND LOSS COEFFICIENT

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 1, Jan-Feb 80 pp 161-163 manuscript received 10 Jul 78

ZAMORA, YE. F., PRUDIUS, I. N., ROMANYUK, M. G., GNATCHUK, N. N. and BUK, N. I., L'vov Polytechnical Institute

[Abstract] An attachment consisting of a control device, channel amplifiers and commutation circuits, to standard automatic panoramic meters of standing wave coefficient and losses is described. The control device contains a starting pulse shaper and pulse counters. The device can be used to monitor three frequency characteristics of a microwave multipole on the cathode-ray tube screen of a display. The pulse counters are designed to control the commutation circuit when measuring multipole or quadripole parameters. The attachment is made in the form of an individual block with

power supply from a 220 volt, 50 hertz system and can be used in combination with standard automatic panoramic meters of standing wave and loss coefficients. Figures 1; references 1: 1 Russian.
[180-6521]

UDC 621.317.757

A SPECTRAL ANALYZER

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 1, Jan-Feb 80 p 278
manuscript received 20 Sep 78

SAL'NICHENKO, A. Ya.

[Abstract] A spectral analyzer designed to measure the noise characteristics of various devices in the low and infralow frequency bands is described. The analyzer is based on a two-channel correlation circuit. The operating mode of the analyzer and the connection circuit of the investigated objects are selected by means of a commutation block. One of the analyzer channels operates in the ordinary mode and its sensitivity is limited by the natural noise of the pre-amplifier. The output voltage is measured by a quadratic voltmeter. The measured signal is amplified and filtered in both channels simultaneously or with a time shift and is fed in the form of two narrow-band processes to the remultiplication block. Figures 2.
[180-6521]

UDC 621.317.757

A SPECIALIZED DIGITAL SIGNAL PROCESSOR

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 1, Jan-Feb 80 p 282
manuscript received 24 Oct 78

BULANOV, A. N., GOLUSHKO, V. V. and MURALEV, A. B.

[Abstract] A specialized digital signal processor, designed to calculate the spectral, time and amplitude characteristics of signals both stored previously and in real time, is described. The multiprogram principle of control permits the use of a wide set of processing algorithms which can be easily changed and supplemented as needed. The processor consists of an input-output controller, arithmetic device operated with 16-digit binary numbers in the fixed decimal mode, internal storage based on integrated

circuits and control permanent storage in which the calculation microprograms are stored. The processor is used to investigate the acoustic noise of the systems and assemblies of nuclear power plants for diagnosis and monitoring. Figures 1.

[180-6521]

UDC 621.385.5+621.383.6

THE CHARACTERISTICS OF MICROCHANNEL PLATES DURING OPERATION IN THE PULSED MODE

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 1, Jan-Feb 80 pp 193-196 first version of manuscript received 10 Aug 77; manuscript received 4 Jul 78

LEONOV, N. B., TYUTIKOV, A. M. and SHISHATSKIY, N. A.

[Abstract] The maximum possible charge density at the output of a microchannel plate and the charge density corresponding to the boundary of the linear mode were determined. The dependence of the linear boundary and maximum charges from the channel output, on channel diameter and external field intensity were also measured. The authors thank A.M. Bonch-Bruyevich for attention to the work, G.S. Kravchuk for assistance and D.K. Sattarov for submitting specimens of microchannel plates. Figures 3; references 2:

1 Russian; 1 Western.

[180-6521]

UDC 621.391.2

A PANORAMIC DISPERSION SPECTRAL ANALYZER

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 1, Jan-Feb 80 p 279 manuscript received 31 Aug 78

GOLIKOV, M. I., SAVCHENKO, I. S., SOBOLOV, N. V. and KHORUNZHIY, V. A.

[Abstract] A panoramic dispersion spectral analyzer for observing the spectral density over a wide range of periodic and single processes is described. The investigated signal can be measured in real time and accelerated sequential spectral analysis is also possible. A dispersion delay line is the main component which converts the signal frequency to a time coordinate. Figures 1.

[180-6521]

UDC: 621.375.132.3

STUDY OF THE INSTABILITY OF A SOURCE REPEATER FOR A 2CC842 INTEGRATED MICRO-CIRCUIT

Moscow **RADIOTEKHNIKA** in Russian, Vol 35, No 2, Feb 80, pp. 87-89, manuscript received 22 Jan 79

ZAGORSKIY, YA: T., KOZLYAYEVA, I. N., SAMUYLLO, V. N.

[Abstract] The variation in transmission factor of a source repeater as a function of temperature is studied by analyzing the device as a series connection of three elementary quadrupoles: two transistors and a transistor plus two resistors. An equation is found which describes the operation of the repeater with respect to direct current to allow analysis of the instability of the feed mode of the transistors in the device. A table presents the experimental variations in parameters as functions of temperature and power supply voltage. The data can be used to plan amplifier circuits, active filters, oscillators and other devices based on this integrated circuit. Figures 2; tables 2; references: 4 Russian.
[173-6508]

UDC: 621.313.342

TRANSIENT PROCESSES IN A SALIENT-POLE SYNCHRONOUS GENERATOR WITH A THYRISTOR SYSTEM OF SELF-EXCITATION IN THE CASE OF SUDDEN SHORT CIRCUITS BEYOND THE TRANSFORMER OF THE UNIT

Minsk IZV.VUZ: ENERGETIKA in Russian, No 1, Jan 80, pp. 3-8, manuscript received 19 June 79

ABRAMENKO, V. M., engineer, Belorussian Order of Labor Red Banner Polytechnical Institute, and BOBROV, V. M., POPOV, YE. N., engineers, VNIIElektromagn (All-Union Scientific Research Institute of Electric Machinery Building)

[Abstract] The results are presented from development and experimental testing of a refined mathematical model of a synchronous generator with a system of self-excitation containing series-connected transformers for precise calculation of possible surges of current and overvoltages in various emergency operating modes in both the stator winding and in the exciter winding in synchronous generators with thyristor exciters. The mathematical model reflects the processes in the stator and the rotor of a salient-poled synchronous generator quite accurately. The paper was submitted by the Department (Kafedra) of Electrical Stations, BPI. Figures 4; references 6: 3 Russian; 3 Western.
[163-6508]

UDC 621.373

A 20-CHANNEL HIGH-VOLTAGE PULSE GENERATOR

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 1, Jan-Feb 80 pp 121-123 manuscript received 30 Jun 78

ANAN'IN, P. S. and KASHIRIN, A. P., Scientific Research Institute of Nuclear Physics Attached to the Tomsk Polytechnical Institute

[Abstract] A 20-channel high-voltage pulse generator with compensation of the main pulse in the control circuit in all channels and with a capability of observing low after pulses is described. The discharger of the high-voltage generator is triggered from a pulse amplifier based on four transistors

and a thyatron. The transformation ratio of the transformer is 1:10, which permits a starting pulse with amplitude up to 500 volts having a wave front of 40 nanoseconds or less to be achieved on the thyatron grid. The generator is designed for non-film derivation of information from range spark chambers when studying nuclear reactions. The authors thank A.V. Pirogov for assistance in production of the generator. Figures 3; references: 3 Russian. [180-6521]

UDC: 621.396.622:621.391.82

ONE POSSIBLE MEANS FOR DECREASING THE NOISE OF OSCILLATORS BASED ON AVALANCHE TRANSIT TIME AND GUNN DIODES

Moscow RADIOTEKHNIKA in Russian, Vol 35, No 2, Feb 80, pp. 50-52, manuscript received 7 Feb 79

VENGER, A. Z., GAVRILOVA, N. I., YAKIMENKO, A. M.

[Abstract] A comparison is presented of the noise produced in oscillators using avalanche transit time diodes (LTD) and Gunn diodes in the self-oscillating and radio-pulsed frequency multiplication modes. It is found that the frequency noise at the output of the radio-pulse multiplier is determined by fluctuations in the initial phase of the radio-pulse process; amplitude noise at the output of the radio-pulse converter is determined by the noise at the r-f filling frequency. The decrease in noise in the radio-pulse frequency multiplication mode was tested with 23X frequency multiplication at 48 GHz; suppression of FM noise reached 50 dB. Figures 1; references: 4 Russian. [173-6508]

PHOTOELECTRIC PHENOMENA AND DEVICES;
ELECTROLUMINESCENCE; ION DEVICES

UDC 621.383.292

THE EFFECT OF EXTERNAL FACTORS ON ESTABLISHING THE OPERATING MODE OF A
PHOTOMULTIPLIER

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 1, Jan-Feb 80 pp 198-200 manuscript received 3 Jul 78

VETOKHIN, S. S., GULAKOV, I.R. and PISLYAK Yu. V. Belorussian State University, Minsk

[Abstract] The effect of storage conditions, temperature and load on the noise properties of FEU-62, FEU-83 and FEU-106 photomultipliers was investigated. The rate of counting dark pulses is stabilized within several minutes after the power supply voltage is switched on in photomultipliers stored in darkness for a long time. Exposure of the photomultiplier to light leads to lengthening of this process to 24 hours or more. The causes of temperature hysteresis and methods of correcting it are discussed.

Figures 3; references: 14 Russian.

[180-6521]

POWER SYSTEMS; EFFECT OF VARIOUS ITEMS ON
POWER TRANSMISSION LINES

UDC: 621.311

POSSIBILITY OF INCREASING THE THROUGHPUT CAPACITY OF ELECTRIC POWER TRANSMISSION LINES BY THE USE OF GLASS-REINFORCED PLASTIC ELEMENTS

Minsk IZV.VUZ: ENERGETIKA in Russian, No 1, Jan 80, pp. 98-100, manuscript received 25 Jun 79

CHERNETSKIY, M. S., engineer, Belorussian Order of Labor Red Banner Polytechnical Institute

[Abstract] It has been found that the use of glass-reinforced plastic structures in overhead power transmission lines can allow a decrease in the width of a line, the load acting on a mast, and in the height of masts, or can increase the length of a span if the previous dimensions are used. The use of glass-reinforced plastic insulating structures also allows quantitative and qualitative improvements of power transmission capacity and related electrical characteristics of power transmission. This article studies these problems in somewhat more detail and demonstrates specifically how the electric characteristics change when glass-reinforced plastic traverses are used for overhead power transmission lines. All calculations were performed using a special program running on a Minsk-32 computer. It is found that the use of glass-reinforced plastic traverses on 110-750 kV power lines can increase the power transmitted by 6 to 36 percent depending on the location of the conductors, or increase the distance of power transmission in 330-500 kV lines by 22-26 percent significantly improving technical-economic indices. The paper was submitted by the Department (Kafedra) of the Resistance of Materials. Figures 3; tables 1; references: 3 Russian. [165-6508]

ON AUTOMATING THE PROCESSING AND ANALYSIS OF THE RESULTS OF INSTRUMENT READINGS OF THE ACTUAL CONDITIONS OF ELECTRICAL POWER NETWORKS

Moscow ELEKTRICHESKIYE STANTSII in Russian No 2, Feb 80 pp 35-38

YERSHEVICH, V.V. and KRIVUSHKIN, L. F., candidates of technical sciences, Ukrainian Branch of Energoset'proyeikt (All-Union Order of the October Revolution State Planning and Surveying and Scientific-Research Institute of Power Systems and Electrical Networks)

[Abstract] Measurements of actual power system parameters during 2 days set aside annually generate an enormous volume of information; these data have been poorly used in the past, primarily because of a lack of standardized processing forms and data processing technology. Automation of instrument data processing is proposed in order to provide the following: 1) The derivation of generalized indicators for network performance, regardless of the completeness and confidence level of the measurement data; 2) The capability of independent direct analysis of all hierarchical levels (PEO - economic planning organizations, ODU - integrated dispatcher control administrations and TsDU - central dispatcher control administrations) for networks at all voltages tested by the given hierarchical level (220 KV and above, by the TsDU; 110 KV and above, by the ODU; and 6 KV and above, by the PEO); and 3) Deriving summary data on remaining networks. The technology for obtaining the generalizing indicators from the measurement data of the actual operating conditions includes two basic components: The plan for processing and transmitting the measurement data, and the output form for the presentation of the results. The flow chart shown for the proposed data transmission and processing system indicates the functions performed at the three hierarchical levels and proposed sample standardized blanks and forms are also shown. The primary tasks of the data processing automation networks are listed. A proposed simplification of the latter procedure introduces additional errors, which are nonetheless smaller than those in the first two cases. The problem of increasing the accuracy of the calculations for existing networks must be solved in a comprehensive fashion, using computers on a larger scale and the labor expenditures for the computations for power networks of different voltage classes must be substantiated on an engineering and economic basis. Figures 1; tables 3; references:

4 Russian.
[182-8225]

OPTIMIZATION OF THE ANNUAL SCHEDULE OF MAJOR OVERHAULS OF THE BASIC EQUIPMENT OF POWER SYSTEMS

Minsk IZV.VUZ ENERGETIKA in Russian, No 1, Jan 80, pp. 65-69, manuscript received 20 Sep 79

YERMAKOV, V. S., doctor of technical sciences, GOL'BIN, D. A., candidate of technical sciences, SLYUNKOV, N. D., engineer, Belorussian Branch, Power Engineering Institute imeni G. M. Krzhizhanovskiy

[Abstract] The "Energiya" combined automatic control system includes a section called Planning of Maintenance in the Combined Power System, which is divided into three stages: 1) Preliminary determination of the quantity of maintenance required; 2) Adjustment of the quantity of maintenance in response to limitations of material, labor and financial resources; and 3) Final composition of the system-wide schedule of maintenance operations. The equations used to generate a mathematical model of the problem are presented and briefly analyzed. The equations allow the maintenance schedule to be optimized with respect to the total cost of operation of the system. References 6: 5 Russian; 1 Western. [165-6508]

THE INFLUENCE OF THE BOOSTED VOLTAGE ON THE SERVICE LIFE OF CABLES CHANGED OVER FROM 6 TO 10 KV

Moscow ELEKTRICHESKIYE STANTSII in Russian No 2, Feb 80 pp 45-49

TROST, L.YE., BARINOV, V.M., SMIRNOV, P.T. and SHCHEGLOV, A.P., engineers, Soyuztekhenenergo-LKS Lenenergo (All-Union Power Engineering Equipment Trust-Leningrad Cable Network of the Leningrad Power Administration)

[Abstract] Five groups of cables removed from service were tested for accelerated ageing when changed over from 6 to 10 KV. The five groups were broken down according to the accrued service time with the first group being in service over 30 years and the fifth in new, unused condition. All of the samples, with a length of up to 10 m each, were checked for their condition and for conformity to the standards under which they were manufactured. All of the groups were satisfactory with the exception of group one where the insulation had dried out and the impregnating compound congealed. The accelerated ageing tests were performed by heating the cables to the established steady-state temperature and cooling them down to the ambient temperature through 200 cycles and simultaneously applying 17.5 KV AC. The heating

temperature of the cores was 15 - 20 percent higher than the temperature which occurs in service. Ionization curves are shown for the insulation as a function of the applied voltage and temperature at various stages in the testing cycle. Tabular summaries for the groups of cables indicate the change in the equivalent breakdown voltage before and after testing, the specific number of faults per 100 km per year at the rated 6 kV and at the increased 10 kV up to 10 years after the changeover. The tests show that the load also influences the ageing of the insulation and the cable service life, a fact which is also confirmed by 10 years of operational experience with a section of cables shifted over from 6 to 10 kV in the Leningrad cable network. Cables which have seen 10 to 15 years of service prior to the changeover can continue to operate for no less than 20 years, given the condition that the load at the end of the indicated service period at the elevated voltage does not exceed half of the maximum rated current and the overloads fall in a range of 0.8 to 1.1 times the permissible loads. Vertical cable sections should be replaced by 10 kV to prepare for any changeover to the higher voltage; the indicated service lives of cables after the changeover are not the maximum and can be increased in individual cases, taking into account the condition of the cables and the insulation wear. The extent of ageing and wear of the insulation can be established by measuring the electrical characteristics and determining the residual equivalent breakdown voltage with subsequent disassembly of no less than three samples of the given group of cables. Figures 4; tables 3; references: 3 Russian. [182-8225]

UDC 621.315.664

MASTERY AND UTILIZATION OF OIL-FILLED CABLES FOR A MAXIMUM VOLTAGE OF 500 kV

Moscow ENERGETIK in Russian No 1, 1980 pp 20-21

ZHAROV, V.P., engineer, PO Soyuztekhnenergo (Expansion Unknown)

[Abstract] High-pressure oil-filled 500 kV alternating current cable lines are being put into industrial service in the USSR. These lines are designed for supplying large amounts of electric power to large cities, for transmitting electric power from large-capacity power plants and for supplying electric power to substations of large industrial enterprises. As many as a few hundred megavolt-amperes can be transmitted through these cable lines. As many as 630 MV·A can be transmitted through a 500 kV line with a core cross section of 625 mm². A history is given of the development and utilization of lines of this sort since 1942. Special emphasis is placed on the reliability of cable lines, which depends to a great extent on the quality of the installation of all elements, and especially on the quality of fabrication of the internal insulation of terminals and connectors installed

manually in the field by installation personnel. The contributions of the PO Soyuztekhnenergo are listed, with regard to technical supervision in the installation of lines. The first 500 kV high-pressure cable line was put into service in 1965 at the Volzhskaya Hydroelectric Power Station (GES) ineni the 22nd CPSU Congress. In 1975-1976 the PO Soyuztekhnenergo made thermal tests in order to determine the load capacities of 500 kV lines at the Toktogul GES and at the Ust'-Ilimsk GES measured the temperature along cable conduits for the purpose of monitoring the overheating of cables as the result of elevated dielectric losses. In 1978 a study was made in order to determine the thermal resistivity of soil. It was found that soil consisting of 50 percent sand and 50 percent gravel has low thermal resistivity and was therefore recommended as a covering for 500 kV oil-filled cable lines at the Toktogul GES. When this mixture is employed, it is possible to increase the transmitting capacity of lines. The fault rates of the cables discussed are as follows: for terminal equipment, such as terminals and transformer lead-ins, approximately 50 percent; for connectors, approximately 9 percent; and for the cables themselves, about 41 percent. It is mentioned that high-voltage tests are not always made after lines are put into service after installation. Gross mistakes committed during installation show up later when the line is used, resulting in an increase in the fault rate. More than 50 percent of damage to cables is physical damage occurring in earth moving operations carried out by construction organizations. It is recommended that construction organizations observe the rules for safeguarding high-voltage electrical lines. It is concluded that experience shows that the cable lines discussed have sufficiently high reliability.
(171-8831)

UDC 621.316.1.017.001.24

ON THE ERRORS IN CALCULATING THE COMPONENT STRUCTURE OF POWER LOSSES IN ELECTRICAL POWER NETWORKS

Moscow ELEKTRICHESKIYE STANTSII in Russian No 2, Feb 80 pp 38-41

ARUTYUNYAN, A.A., engineer, Arm NII energetik (Armenian Scientific Research Institute of Power Engineering)

[Abstract] The losses in the individual components of a 35--220 KV network of the Armenian power system are analyzed in order to develop an algorithm and to present the results of calculating these losses on the basis of the annual load charts for all of the component units. Three procedures for loss calculation are compared: 1) Based on a method set forth in the "Provisional Instructions for the Computation and Analysis of Electrical Power Losses in the Power Networks of Power Systems"; 2) Based on an average load procedure proposed by G.M. Kayalov in 1976; and 3) A method using the characteristic daily load graphs for operational and nonoperational days.

The first procedure can only be used to determine the overall losses in a network, because it does not single out the sections with the greatest losses. The second method can also be used for loss prediction, and thus for planning power losses in existing networks for individual peak load power stations for each month, quarter, and year as a whole. A drawback to the first two procedures is the considerable error in the loss computations: these errors run as high as 38.8 percent for individual sections in the sample adduced in this paper. The procedure predicated on daily load schedules produces results which most closely approximate the true values; however, the method is quite labor intensive and it is practically impossible to obtain the requisite volume of data on the load schedules. The following are necessary: 1) Development of a set of programs for measurement result transmission and processing; 2) Acceleration of the development and introduction of mutually coordinated data banks for electrical networks at the various administrative levels; and 3) The development and introduction of standardized forms for recording the measurement data. Figures 1; tables 3; references: 3 Russian.
[182-8225]

UDC 631.371.1:621.3.015.2

ON THE ELECTRICAL POWER QUALITY IN RURAL AND WORKERS SETTLEMENTS

Moscow ELEKTRICHESKIYE STANTSII in Russian No 2, Feb 80 pp 50-51

KRIKUNCHIK, A.B., candidate of technical sciences, Teploelektroproyekt (All-Union State Institute for the Design and Planning of Thermal Electric Power Stations)

[Abstract] State Standards GOST 13109-67 and GOST 13104-67, cite maximum permissible deviations of -5 to +10 percent of the nominal voltage or +5 percent of the nominal, depending on the class of the power consumers. Two examples are given where these norms were violated. These are 1) A region of multistory apartment houses in Moscow, where the greatest per unit deviations in the voltage ranged from -2 to +9 percent of the nominal; and 2) A workers' settlement in the Moscow oblast with single apartment and duplex apartments and private plots, where the greatest per unit deviations in the voltage ranged from -29 to +6 percent of the nominal, and in individual cases, the voltage delivered to the consumers dropped to 63 percent of the nominal. The power deviations in the first case are satisfactory, though in the second, they are impermissible, because during low voltage periods in the evening it is practically impossible to use household appliances. The power network in this case is not faulted as being obsolete, but rather poorly designed in accordance with inadequate standards. The actual design value for the specific load per apartment was taken as 0.5 to 1.1 KW,

about 5 to 6 times less than the 3 to 5 KW called for in the norms. Slow implementation of measures to switch 6 KV networks over to 10 KV is also cited and changes are called for in GOST 13109-67 to improve rural services. [182-8225].

PRODUCTION TECHNOLOGY

UDC 621.382.032.27

MANUFACTURE OF CONTACTS TO HALL TRANSducers

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 1, Jan-Feb 80 p 265
manuscript received 24 Aug 78

POTAYENKO, K. D., Physicotechnical Institute of the Uzbek SSR Academy of Sciences, Tashkent

[Abstract] A method of manufacturing quasi-point contacts to gallium arsenide with increased mechanical strength is described. The method of manufacturing the resistance contacts combines the advantages of group technology with high mechanical strength and precision of manufacturing leads of given shape. Figures 1; references: 1 Russian.
[180-6521]

PULSE TECHNIQUES

UDC 538.567.46

PERIODIC MODES IN PULSE SYSTEMS WITH TIME MODULATION

Novocherkassk IZV.VUZ: ELEKTROMEKHANIKA in Russian, No 1, Jan 80 pp 9-13
manuscript received 14 Jul 77; after completion, 14 Feb 78

DEMASHOV, VALERIY SERGEYEVICH, candidate of technical sciences, Dotsent, Ryanskiy Radio Engineering Institute; SAMSONOV, YULIY DMITRIYEVICH, candidate in technical sciences, Dotsent, Ryanskiy Radio Engineering Institute; and LIVAROV, VLADIMIR IVANOVICH, assistant, Ryanskiy Radio Engineering Institute.

[Abstract] The dynamic characteristics of a pulse-time system with automatic control are analyzed where both input and output coordinates are pulse sequences generated by respective converters. The pulse repetition period is related here to a continuous coordinate, which reduces the system to one with pulse-width modulation. A difference between time intervals is detected and converted by an integrating network in the main branch of this feedback system. Multiperiod modes are generally possible, but conditions of balance are satisfied only for one fundamental period, and under certain conditions beats will occur. The periodic modes and their parameters are calculated here by the method of harmonic linearization, the problem becoming that of a feedback system with one nonlinearity. This is demonstrated on a simple pulse converting system with typical characteristics. Figures 3; references: 3 Russian.
[166-2415]

UDC 621.374.34

A RETUNABLE RADIO PULSE ENVELOPE SHAPER

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 1, Jan-Feb 80 pp 126-128
manuscript received 17 Jul 78

AZARNYY, YU. A. and KACHANOV, YE. I., Leningrad Electrical Engineering Institute

[Abstract] A retunable radio pulse envelope shaper for increasing the accuracy of measuring the parameters of a reflected radio pulse by using

a frequency synthesizer based on shift registers is described. The pulse shaper contains series-connected retunable shift register stages which determine the length of the video pulse and stages which determine the on-off time ratio of the repetition. The pulse repetition rate, which is a whole, multiple pulse length, varies with variation of pulse length in the shaper. Each stage of the pulse shaper is constructed on the principle of a ring counter with a division coefficient of 10. The range of variation of the pulse envelope parameters can be expanded by dividing the carrier frequency used to shape the time frequency of the shift registers. Figures 1.

[180-6521]

UDC: 535.317:681.327

FOURIER HOLOGRAMS OF CODE DISKS

Leningrad IZV.VUZ: PRIBOROSTROYENIYE in Russian, Vol 22, No 12, D-c 79, pp. 41-44, manuscript received 11 Apr 79

BAN'KOVSKAYA, YE. N., MAYOROV, S. A., OCHIN, YE. P., ROMANOV, YU. P., TROPCHENKO, A. YU., Leningrad Institute of Precision Mechanics and Optics

[Abstract] The method of optical holography is widely used in information processing and storage systems. The possibility is studied of constructing a holographic optoelectric angle-to-code converter, an analog-digital device which converts the angle of rotation of a shaft to a digital code by the use of a code disk, a set of alternating transparent and nontransparent apertures. If when the hologram is recorded one of the beams is not perpendicular to the surface of the photographic plate, when the image is restored it is impossible to read the angle directly by means of a nonmoving line of photosensors. This brings up the problem of adjusting the hologram directly on the shaft to eliminate the "beating" which results. A system using a rotating viewing beam is suggested for restoration of images from Fourier holograms synthesized with a computer. The system can be used if the inclined beam is the object beam, while the reference beam is perpendicular to the plane of registration. This system is suitable for restoration of images of code disks using either transmission or reflection holograms. A diagram of the system is presented. The paper was recommended by the Department (Kafedra) of Computing Techniques. Figures 2; references: 4 Russian.

[164-6508]

UDC: 534.852

ERROR RELATED TO QUADRUPLING THE CARRIER FREQUENCY IN FM MAGNETIC RECORDING

Moscow RADIOTEKHNIKA in Russian, V:1 35, No 2, Feb 80, pp. 48-50, manuscript received 18 May 79

GORDEYEV, L. S.

[Abstract] Of the many known methods of quadrupling frequencies, a smaller group of methods can be differentiated which is suitable for application in FM magnetic recording. All of these methods involve formation of pulses of constant area at the moment of transition of the carrier through zero and at the moment when the maximum is reached. To determine the moment when the maximum is reached, the carrier may be either differentiated or integrated. This article analyzes the errors which arise with either procedure of quadrupling the carrier frequency for a line with noncorrected amplitude-frequency characteristic. The results of calculation clearly show that quadrupling a carrier frequency has a great influence on distortions of the signal. These distortions do not arise if correction is used to assure a linear amplitude-frequency characteristic of the line with preservation of a linear phase-frequency characteristic. Figures 1; references 6; 4 Russian; 2 Western.
[173-6508]

SEMICONDUCTORS AND DIELECTRICS;
CRYSTALS IN GENERAL

UDC: 621.375.126

NOISE PROPERTIES OF HF AND MICROWAVE TRANSISTORS

Moscow RADIOTEKHNIKA in Russian, Vol 35, No 2, Feb 80, pp. 52-54, manuscript received 30 May 79

TEKSHEV, V. B.

[Abstract] Known equations for analysis of the noise properties of transistors are obtained using simplified equivalent transistor circuits and a number of assumptions which are not correct because of the high and microwave frequency bands, in which the noise characteristics of transistors are greatly influenced by chassis elements. Since HF and microwave transistor amplifiers are usually made of multiple stages of quadrupoles, it is convenient for simplification of calculations to describe the individual quadrupoles including the transistors by an equivalent circuit. Equations are derived for the noise properties under these conditions. These equations, produced without the use of any simplifying assumptions, fully describe the noise parameters of transistors at frequencies where the influence of transistor body elements can be ignored. The equations which are derived were used to calculate the noise characteristics of a number of Soviet HF and microwave transistors, and the agreement with experimental data was found to be good. Figures 3; references: 9 Russian.
[173-6508]

SYSTEMS ANALYSIS

UDC 621.95:621.3

THE METHODOLOGY OF SYSTEMS RESEARCH IN RADIO ENGINEERING

Moscow RADIOTEKHNIKA in Russian, Vol 35, No 2, Feb 80, pp. 6-20, manuscript received after revision 15 Aug 79

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[Abstract] The purpose of systems research is to determine the basic trends in development of large goal-directed systems. Systems research does not attempt to answer the question "what will happen," but rather only the question "what could happen" under certain conditions which can be influenced. This article analyzes the application of the techniques of systems research to contemporary and future large radio systems, including personnel, broadcast equipment and computers. A mathematical model of a large radio system is briefly described. It is noted that mathematical models as they currently exist can predict the results of application of certain actions to a large system, but cannot in themselves decide which controlling actions should be tested in the model. The author suggests that future mathematical models will be able to perform this task as well. An appendix lists the basic quantities used in the system of units in which the mathematical model is stated. The author thanks I. A. Boloshin and A. P. Peutov for valuable comments. Figures 6; tables 3; references 11: 6 Russian; 5 Western. [173-6508]

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